1995
Executive Research Project
S5

Sustaining the Intelligence Industrial Base: Issues and Alternatives

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UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY N/A	3. DISTRIBUTION/AVAILABILITY OF REPORT Distribution Statement A: Approved for Public Release: distribution is unlimited.
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE N/A	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) NDU-ICAF-95- S5	5. MONITORING ORGANIZATION REPORT NUMBER(S) N/A
6a. NAME OF PERFORMING ORGANIZATION Industrial College of the Armed Forces 6b. OFFICE SYMBOL (If applicable) ICAF-AR	7a. NAME OF MONITORING ORGANIZATION National Defense University
6c. ADDRESS (City, State, and ZIP Code) Fort McNair Washington, D.C. 20319-6000	7b. ADDRESS (City, State, and ZIP Code) NDU-LD-SCH Ft. McNair Washington, D.C. 20319-6000
8a. NAME OF FUNDING/SPONSORING ORGANIZATION N/A 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N/A
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification) Sustaining the Intelligence Industrial Base: Issues and Alternatives

12. PERSONAL AUTHOR(S) R. John Cully

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Research	FROM Aug 94 TO Apr 95	1995 April	39

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

See Attached

DTIC QUALITY INSPECTED 5

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL Susan Lemke or Tina Lavato	22b. TELEPHONE (Include Area Code) (202) 287-9458	22c. OFFICE SYMBOL NDU-LD-SCH

DD FORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

ABSTRACT

Sustaining the Intelligence Industrial Base: Issues and Alternatives

by Col. R. John Cully, USA

The U.S. Intelligence Community has growing concerns about the continued viability of the Intelligence Industrial Base (IIB). What makes up this important portion of the overall U.S. industrial base? What alternative models are available to better manage the Intelligence Industrial Base in light of declining government spending? This research paper explores these and other questions for intelligence and defense policy makers. It suggests roles for Congress, the intelligence community, and industry to play in preserving this critical component of national defense.

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INTRODUCTION

The downsizing occurring throughout the defense industry raises concerns for all segments of the defense community, including its intelligence component. The diminished threat caused by the end of the Cold War reduced requirements for much of the defense industrial capacity originally developed to meet the threat of the former Soviet Union. The core of this production defense capacity, known as the Defense Technology and Industrial Base (DTIB) has been a basic element of U.S. national power for the last 50 years. However, without a sizable and current external threat, Department of Defense (DOD) spending has been reduced and has been on a downward slope for the past ten years.[1]

This reduced demand caused a corresponding reduction in the DTIB. From 1985 through 1994, DOD purchases of goods and services fell by 70 percent, leaving the defense industry with an excess production capacity of over 40 percent.[2] Budget projections through 1997 show continued cuts in funding. These reductions in DOD spending for weapons, systems, and maintenance erode the DTIB. Defense planners in both industry and government must concern themselves with managing and maintaining defense industrial production capabilities in the event they are needed again-history shows us they will.

An important part of the DTIB is the Intelligence Industrial Base (IIB). Congress recognized the importance of the IIB in the 1995 Intelligence Authorization Act. The House Permanent Select Committee on Intelligence stated:

> "the unique industrial base that supports intelligence programs is at risk because of uncertainties about future intelligence needs and increasing competition for available funding. The committee believes that the nation needs to maintain a strong indigenous industrial base to enable it to develop the intelligence systems, sensors, and processing capability that will be needed in the future. The committee concludes that there are significant and vital elements of the intelligence base that may now be at unacceptable risk." [3]

The health and maintenance of the IIB will continue to be a great concern to the U.S. intelligence community.

Three interrelated questions face policy makers in the executive and the legislative branches in relation to the IIB:

(1) What is unique about the IIB in relation to DTIB?

(2) Do we need to maintain the IIB in view of the reduced Cold War threat?

(3) If so, how can we manage the IIB most effectively?

ESTABLISHMENT of the INTELLIGENCE INDUSTRIAL BASE

To understand these issues, decision makers must have a perspective on how the IIB evolved historically and how the IIB develops current intelligence systems. Throughout our competition with the former U.S.S.R. during the Cold War, the U.S. pursued an intelligence collection strategy based on high technology to compensate for the closed nature of Soviet society. The U.S. saw technology-based intelligence collection systems as a substitute for reliance on human collectors (spies). This strategy developed historically during the Allies' World War II experience and grew after the war from the difficulties they encountered in gaining access to closed totalitarian states. To understand this strategy policy makers must understand World War II and post-war intelligence collection experience.

The Soviet Approach Versus the U.S. Approach

At the end of the Second World War, the Soviets knew that they lagged the U.S. in both technology and industrial capacity. The war had destroyed their industrial and technological bases and years of repair were needed just to return to their pre-War condition. Against this backdrop stood the U.S. with its industrial base intact and possessing the technological base to further exploit its recent nuclear achievement.[4]

Viewing the U.S. as a threat to their post war plans and knowing that delays while rebuilding their technology base would place them further behind U.S. advances, the Soviets decided to capitalize on their existing intelligence infrastructure to acquire Western technology.[5] During the war, the Soviets had developed extensive networks of spies and informants throughout German-occupied Western Europe. These sources provided the bulk of Soviet intelligence on German forces and targets. The Soviet World

War II intelligence system, based on human sources, became the foundation for their intelligence system in the Cold War. They penetrated Western military forces, government decision making bodies, political parties, technical facilities, universities, and intelligence organizations.[6] In the U.S., they often targeted military and civilian intelligence agencies to obtain valuable information on high technology collection systems through sources such as Walker, Whitworth, Pelton, Conrad, and Howard.[7] The recent Ames case demonstrates their continued reliance on human collectors to keep pace with U.S. intelligence agencies and development of technical intelligence systems.

The U.S. learned a different lesson from World War II. Denied direct access to German-occupied Europe, the Allies had to infiltrate persons into denied areas. The history of the Office of Strategic Services (OSS) , predecessor to today's CIA, is filled with daring stories of men and women who infiltrated clandestinely from England through neutral countries or directly by airborne or maritime insertion. These were high risk missions which many times resulted in the deaths of highly valued allied personnel.[8] While the Soviets accepted this risk, the U.S. and its allies began to gravitate towards technical collection systems in order to make up for lack of access to the German-held continent.

Because the target areas were close to the allies and well within the range of their aircraft, airborne photographic reconnaissance systems were developed.[9] These were followed by radio intercept planes, based in England, flying over enemy territory to collect intelligence on troop movements and other targets. By the end of the War, the

U.S. had developed technical systems that could collect intelligence more efficiently and effectively human intelligence collection .[10]

Throughout the Cold War, airborne technical reconnaissance proved its worth. Perhaps its best known achievements occurred during the Cuban Missile Crisis. U-2 photographs provided the first concrete evidence of Soviet missiles in Cuba. These photographs were used by President Kennedy and top policy officials during the crisis as a quick reaction information source for decision making.[11] Cold war policy makers came to rely on intelligence obtained from airborne technical reconnaissance over and around China and the Soviet Union to support U.S. decision making concerning their nuclear programs, arms developments, and military force movements.[12]

Even with their highly placed sources within Western governments and industries, the Soviets could not keep up with Western advances. By the time the Soviets gained the technology to detect and destroy high altitude reconnaissance aircraft culminating in the U-2 shoot-down, the U.S. was well on its way to deploying operational space-based systems.[13] As Robert Kohler, former Director of Engineering in the Directorate of Science and Technology, CIA, stated:

"our clear competitive advantage in the intelligence business was in technical intelligence systems. We used that advantage and the extraordinary amounts of information it provided to leverage our political, economic, and military strategies and tactics to achieve a successful outcome to the greatest moral struggle of our age." [14]

The U.S. Intelligence Industrial Base Today

Since the end of the Cold War, the intelligence industrial base has continued to produce the technical intelligence systems used in treaty verification and arms control. Used operationally, these systems helped provide allied success in Operation Desert Storm. From the outset, President Bush shared satellite imagery of Iraqi troop concentrations to warn the Saudis and build coalition support against the Iraqis.[15] The Iraqis were without this advantage. Except for a limited aircraft photographic reconnaissance and surveillance capability, they relied heavily on human source collection. Their aircraft were detected by U.S. technical systems and interdicted by allied aircraft, denying the Iraqis intelligence regarding U.S. and allied force dispositions and deployments.[16] The U.S., once again, enjoyed an intelligence advantage with its space-based and airborne technical systems which were impervious to Iraqi interdiction.

U.S. reliance on high-tech, space-based systems has made them the foundation of the Intelligence Industrial Base. Satellite technology and space lift form twin pillars supporting the IIB. In a military context they would be what Clausewitz called "the center of gravity" of the intelligence community. This is true because technologies developed for space-based collection systems have migrated to the rest of the intelligence system for other collection applications and to other sectors of the defense establishment as well. Sensors developed originally for space systems are used on aircraft, unpiloted airborne vehicles, and ground-based collection systems.[17] For instance, specially developed detection sensors are mounted on military aircraft to locate troop concentrations, command centers, and equipment sites for intelligence and targeting purposes. Additionally, the IIB provides technology used in other defense applications.

Advanced computer applications designed to sort and analyze the huge volume of data from satellites is now used in target acquisition systems to support field commanders .[18] Communications and delivery systems developed to move data have "spun off" throughout the intelligence system and are seen in many areas of DOD.[19] Micro-electronics technology developed to reduce size and weight of space payloads is now routinely found in weapons systems, communications systems, and information systems throughout DOD. In this way, the IIB supports the DTIB by spinning off technology for other uses than intelligence for application useful in other parts of the defense establishment.[20] The space-based segment of the intelligence industrial base has become the technology driver and foundation for the entire U.S. Intelligence Community.

MANAGEMENT of the INTELLIGENCE INDUSTRIAL BASE COMPARED to MANAGEMENT of DEFENSE TECHNOLOGY and INDUSTRIAL BASE

The DTIB has been defined as the personnel, institutions, technology, and facilities used to develop, manufacture, and maintain weapons and supporting defense equipment needed to meet U.S. national security objectives.[21] By using this definition and associated management models, similarities and differences can be established between the two industrial bases. The definition for the DTIB has utility for defining the IIB. Both are obviously made up of people, institutions, technology, and facilities. Both have engineering, research/development(R+D), production and maintenance capabilities forming their functional elements. While parallels exist in the structures of the two industrial bases, examination of the internal management methodologies reveals marked differences. As both are heavily dependent on research and development, a model developed by the Congressional Office of Technology Assessment (OTA) to illustrate the DOD R+D process can best contrast product development flow through each industrial base.[22]

Research and Development in the Defense Technology and Industrial Base

The DOD Research Process consists of five phases. The phases consist of Basic Research, Exploratory Research, Advanced Technology Development, Advanced Development, and Full Scale Engineering Development. For their model, OTA selected jet engine research and development as an example to describe the DOD Research Process used in the DTIB. In Phase One, Basic Research, the process is concerned with primary elements such as developing new composite materials that might make engines lighter, providing better thrust to weight ratios. New theories of aerodynamics and thermodynamics would be investigated. Much of the research in this phase is done by universities through a DOD contract or grant.

The second phase, Exploratory Development, would consist of bench tests of components developed and designed based on the phase one research. This research is frequently performed by government labs. Phase three, Advanced Technology Development, is generally the first contractor involvement in the R+D process in the DTIB. A contractor at this stage would attempt to integrate the various materials, designs, technologies, and components developed in the previous stages into demonstrations of the components working together. This is known as a "core demonstration". In the jet engine example, a likely scenario would be testing the integration of components such as a newly designed turbine blade mounted on shafts fabricated from a new alloy.

In the next phase in the R+D model, Advanced Development, a contractor would attempt to integrate the core demonstrator into a specific application such as a new engine for the F-16 aircraft. Existing components on an F-16 would be modified to produce a vehicle for the last phase: Full Scale Engineering Demonstration/Prototype. This would complete the R+D phase and establish the new variant in the acquisition system for possible procurement and fielding.

Testing alone could take years before any decision is made to commit to acquisition. The final acquisition phase may take a number of years before a contract is released for procurement and a system is eventually fielded into the force structure. At any step along the way the new technology may be redesigned or even restarted to reduce risk before initiating the next phase and committing additional resources. While critics of the DOD Research and Development system complain about of the length of time required from concept to fielding, the DOD system does provide the DTIB development process latitude not available in the IIB.

Research and Development in the Intelligence Industrial Base

In analyzing research and development of space-based systems in the IIB, the DOD model is valid to a point. The point of departure from the DTIB occurs early in the R+D model. At the Advanced Technology Development phase, an acquisition decision is required which leads to launch or rejection of the technology.[23] The reason is that space is an environment that can only be simulated on Earth. A decision to launch is a decision to leave the R+D model.

Instead of continuing in the R+D process, a procurement decision is made, the satellite is built, integrated with its launch system, and launched. In the majority of cases it becomes operational. Acceptance testing occurs, de facto, when the satellite enters orbit, deploys its antennas, responds to ground control, and begins collecting data.[24] While tests on Earth can be conducted to simulate variables such as vibration and stress of launch, no one really knows if a space-based project is successful until a space vehicle is launched and the payload is checked out in orbit. The space environment is so foreign and the technology integration so unique that the only assured acceptance test is for the system to operate in space.

The developer of the tank or plane in the DTIB can take that system to the real operating environment anywhere in the world and return it for more modification, testing, or rejection. The DTIB contractor works from an established technology base and evolves systems from the current version of the system to the next. Risk and resources are managed incrementally. Space is still an area of experimental development, and success is often an all-or-nothing proposition. As in the early stages of other developmental technologies like nuclear energy, the government is usually the main procurer and operator since the costs associated with failure are often total loss.[25] This is not to say that the government assumes all risk. It means that the government and contractor relationship is integrated at all levels and the government is more involved in the IIB process than in the DTIB process.

Fewer contractors today have the financial ability to participate in these joint development arrangements with the government. Risk associated with space system development is even greater now with declining requirements and funding for these systems. Fewer launches means that costs are spread among fewer opportunities for success and can not be recouped until acceptable systems are developed and deployed. Today there are five primary contractors that build or launch space vehicles (down from nine in 1984). The high risk of failure coupled with the declining requirements means that fewer companies will remain in the satellite business.[26]

U.S. GOVERNMENT POLICY MAKERS DIRECTLY AFFECTING The INTELLIGENCE INDUSTRIAL BASE (IIB)

Policy affecting the intelligence industrial base is formulated by a number of players both in and out of government. Primarily, they are: government agencies such as the National Reconnaissance Office (NRO), the Central Intelligence Agency(CIA), National Aeronautic and Space Administration(NASA), Department of Defense(DOD), the Congress, and various Presidential advisory committees. Additionally the interests of contractors, financial markets, academia, and labor influence IIB Policy. An ongoing policy debate between NASA's development of launch vehicles for the manned space program and DOD's development of launch vehicles to support the unmanned space program is a good example.

National Aeronautics and Space Administration

NASA was established by President Eisenhower to provide a clear distinction between peaceful use of space and DOD's military and intelligence uses of space initiated after World War II. Congress designated NASA as the lead agency for space launch R+D to develop technology designed to expand scientific knowledge of space for peaceful purposes.[27] While NASA is chartered as the lead agency for space launch technology, DOD provides launch systems for the intelligence community primarily as an outgrowth of its R+D for strategic weapons programs. The current backbone of the DOD launch systems (Atlas, Titan, and Delta) all had their beginnings as Inter-Continental Ballistic

Missiles and were later modified to carry payloads. The sensor payloads developed in the IIB for imaging, weather forecasting, and signals intelligence all require lift systems for space access and primarily use unmanned systems.

Department of Defense

The DOD requirement for unmanned space access is linked through government policy to NASA's requirement for manned space access. NASA provides the U.S. Government the launch systems needed for manned space flight and commercial access to space. NASA's space systems such as the space shuttle and space station have manned space flight as their primary centerpiece. Manned systems are much more expensive than unmanned systems because manned vehicles must support human life in space and provide an increased margin of safety against launch and recovery risks.[28] Unmanned lift systems are therefore cheaper to build, maintain, and operate since the increased costs for safety are unnecessary. The two separate development tracks for manned and unmanned launch systems came into conflict with the budget cutbacks of the 1970's.

President Nixon approved NASA's shuttle proposal to develop a reusable space launch system for placing people and payloads into orbit for scientific and commercial missions in 1972. NASA, to that point, had developed a family of expendable launch systems culminating in the Saturn V, which had taken U.S. astronauts to the Moon. While

NASA started its shuttle program, DOD continued to develop and rely on unmanned lift systems for military and intelligence requirements.

In 1977 the Carter Administration decided that the U.S. could not afford both DOD's and NASA's launch research programs.[29] The Carter administration persuaded Congress that continued development of heavy expendable reusable rockets should be abandoned in favor of development of the NASA shuttle. The administration's position (articulated by NASA) was that the shuttle, once operational, would be able to satisfy both scientific/civilian and military/intelligence launch requirements. This approach would realize savings and increase efficiency. NASA felt that centralized pooling of space launch funding into the shuttle program would provide savings. The NASA rationale was that the savings would be realized after the sunk costs of developing the shuttle were paid because the shuttle would be refueled and launched again while expendable rockets that were fired once could not be reused.

Additionally, NASA maintained they could provide launches on a much more frequent basis than DOD could provide because refueling a reusable shuttle eliminated the time and the costs of assembling the multiple stages of unmanned rockets.[30] The NASA proposal envisioned a fleet of five shuttles providing almost weekly space access. NASA believed they could singularly provide DOD, the intelligence community, and themselves increased space access for civil/scientific and military/intelligence uses of space.

The Intelligence Community

The intelligence community thought that the development of unmanned launch systems should continue since the IIB was developing larger and more capable sensors. Their concern was that the shuttle program might not meet its operational target date of 1980 and the intelligence community would be without lift for the newer, heavier systems due in the early 1980's.[31]

The shuttle became operational in 1981 and began regularly scheduled operations in 1982. The program was heralded as a success until the Challenger disaster of 1986. Shuttle launches were halted for almost three years leaving DOD with only its ICBM variants to launch intelligence payloads. Just prior to the Challenger accident the IIB had succeeded in developing new technologies, sensors, and payloads which required the heavier lift capability envisioned by DOD and the intelligence community. The new IIB sensors could not be lifted and the intelligence community was without the space access it needed.

The Space Access Problem

The dual track heavy lift approach to both manned and unmanned missions still has not been resolved as a matter of policy.[32] Using the shuttle to put satellites in orbit has not been a cost effective method for space access. Placing satellites in orbit using the manned

shuttle has been compared as "similar to building an ocean liner, sailing it from the United States to Europe and when within sight of land using a rowboat to reach shore."[33] A new, cost effective, initiative is needed to satisfy the space lift requirements of DOD and the IIB.

In 1991 President Bush directed both DOD and NASA to study development of a launch system to support commercial, civil, military, and intelligence uses of space. This began another quest for a new system to provide reliable, low-cost space access to accommodate the increasing number of U.S. space users as well as to compete with foreign launch providers. DOD proposed lift technology centered on an unmanned multi-stage heavy rocket, based on proven technology, and incremental improvements. NASA believed that the requirement can be met as a complement to the manned space station through a new technological approach known as the single-stage-to-orbit system (SSTO).

SSTO is considered revolutionary and technologically a leap forward. It is currently in the research and design stage.[34] Banking on a new revolutionary approach to space lift gives many policy makers pause given the experience of the Challenger. The issue of which technology policy and approach to utilize is still under debate by the White House Office of Science and Technology, DOD, and NASA.[35] This policy conflict between the competing agencies delays improvement and wastes the limited resources remaining in the IIB.

Current Status of the Lift Problem

Over the past 5 years, the U.S. has spent $3 billion to determine the best method of providing launch access and has only numerous studies to show for it. Meanwhile, the U.S. share of the commercial space launch industry continues to decline.[36] Loss of market share in the world commercial space launch industry impacts on the intelligence industrial base. This loss of market share means that IIB contractors do not realize profits needed to reinvest in research for the next generation of lift and sensor technology needed to maintain our competitive edge[37]. Last year the U.S. share of the world space launch industry fell to an all time low of 35 percent from an 80 percent market share in 1977. The French now control the space launch market.[38]

A recent U.S.Air Force study found:

(A) foreign launch systems are more cost effective.

(B) Japanese and French rockets are the most modern technologically.

(C) Russian and French systems are the best designed for efficient lift.

(D) Chinese, Russian, and French systems provide cheaper lift per payload cost.

(E) The Russians can launch a heavy lift system in 21 days; it takes the U.S. 198 days to launch a heavy lift system.[39]

The higher costs associated with operating and maintaining older launch systems drain IIB funding, which means that fewer launches occur, further curtailing research and technology advances. This downward spiral must be reversed.

The Problem of Conflicting Policy

As the funding drawdown continues, governmental policy decisions must be coordinated to achieve optimal results from the limited remaining IIB resources. For instance, the stated policy of both the Bush and Clinton administration has been that R+D will be exploited to the maximum extent to develop the new technologies needed for the future. Both administrations have been consistent in this policy in their respective technology and industrial guidance. The latest guidance provided by the Clinton Administration contained in "Technology for America's Economic Growth: A New Direction to Build Economic Strength" states:

> "We must also turn to: Research and experimentation tax credits and other fiscal policies to create an environment conducive to innovation and investment...International science and technology cooperative projects that enhance U.S. access to foreign sources of science and technology, contribute to the management of global problems, and provide the basis for marketing U.S. goods and services..."[40]

This policy directly affects the IIB and should have a positive impact since the IIB is so heavily dependent on R+D. However, Defense Federal Acquisition Regulation (DFAR) 275.008 prevents the funding or purchase of R+D technology for defense that originates outside the U.S. Under this restriction, R+D contractors who provide new technology to the IIB are precluded from buying technology directly from foreign developers without time- consuming waivers to import and export restrictions. These delays add to costs which are counterproductive in a resource constrained environment.[41]

The Added Costs of Policy Conflict

This DFAR runs in exact opposition to the Clinton technology policy and impedes DOD (the largest source of R+D funding in the IIB) from obtaining the best technology needed to support the IIB at the lowest cost. Many acquistion regulations are based on dated policies and the entire acquistion system is under review for needed reform. One method to avoid delays is the use of a secondary developer (also known as a "work around"). In this case a U.S. university or other research institution is selected by the foreign subsidiary and provided the technology to continue development. The U.S. firm contracts with the non-profit organization to provide the technology to the U.S. firm. This practice adds to costs which are passed on to the consumer, in this case the U.S. government.[42]

While importing new technology costs time and money, exporting IIB technology to defray costs is equally complicated. The Congressional Office of Technology Assessment suggests that one method to reduce costs is to commercially market existing technologies that are no longer "cutting edge" and reinvest the associated profits into the next technology generation.[43] The commercial use of satellite technology has increased in the world market. The foreign interest in medium resolution imaging satellites is increasing for mapping and resource exploration, with the French and Germans aggressively pursuing this market. With declining U.S. government funding, IIB satellite developers would like to export “good enough technology" while retaining the state- of- the- art

technology for U.S. government uses. Government oversight of these sales would be maintained but export control would be liberalized. Profits from these sales would offset current reductions in R+D funding and be used to develop the next generation of IIB satellite technology. The satellite industry has pursued this initiative with NASA, DOD, CIA, and NRO for the last five years. While some agencies have given their individual approvals, none of the government agencies has coordinated for approvals outside of their own bureaucracy.[44] The U.S. intelligence industrial base continues to lose market share and capital because no coordinated policy has been provided by the various government intelligence and space policy players.

GOVERNMENT POLICY MAKERS And PRACTICES WHICH INDIRECTLY AFFECT The INTELLIGENCE INDUSTRIAL BASE(IIB)

Other policy players within government such as the Departments of State, Transportation, Commerce, Justice, and Treasury indirectly but significantly affect the IIB. Examples include Treasury Department tax policy on investment for R+D; Commerce Department tariff and export policy; and Department of Justice and the Federal Trade Commission policies on anti-trust. The indirect players often have more impact on the IIB than the direct players, even though their actions are not intentional.

The Securities and Exchange Commission

An example of an agency that would not readily come to mind as a policy player affecting the IIB is the Securities and Exchange Commission (SEC). The SEC has a rule that allows litigants the right to demand corporations' financial records without specific allegations of financial impropriety. The effect of this rule is that private securities lawyers can sue high-tech corporations and their officers when an unexpected event such as a test failure occurs. These unfortunate events are a fact of life in the high risk business environment associated with cutting edge technology development. However, lawyers can claim frivolously that company officers should have foreseen and predicted an unfortunate occurrence that would delay profits to stockholders. This rule, known as the 10b-5 rule, is a burden on companies of the IIB. High tech companies have become targets paying 40 percent of all the damages resulting from these suits .[45] This requires high-tech companies to pay for items such as officers' liability insurance and bonding. Besides the direct legal costs stemming from litigation, IIB firms incur significant legal expenses to preclude grounds for law suits under the 10b-5 rule. Extensive and expensive legal research is a necessary defensive measure before an equity offering and adds to the time required before an offering is made to the financial markets. This translates to increased costs of 15 to 20 times what foreign competitors pay to preclude this type of litigation.[46] These charges, of course, add to development costs and drain much needed funding areas from productive activities such as research.

The quest for development capital can delay new high-tech projects for months while the time required to raise large amounts of venture capital for a new R+D project off-shore can be as little as two-to-three weeks. The same offering in the U.S., due to 10b-5 procedures and other legal protections, can take six months to a year.[47] Kendall Research corporation, a high-tech computer applications firm that designs specialty software for IIB firms, was recently sued through 10b-5 rule and settled before trial to prevent a drawn out court battle. The unexpected legal costs, however, have placed Kendall in a difficult financial situation, causing lenders to lose confidence. Kendall is now in the process of reorganization through bankruptcy.[48]

These suits result in increased overhead costs that eventually are borne by decreasing funds of the IIB. While the Clinton technology policy stresses and encourages private investment in R+D, this SEC policy inhibits capital formation. While remedies must be available to those wronged through fraud or illegal activities, some balance must be provided the IIB to protect against frivolous and nuisance law suits.

ALTERNATIVE MODELS To SUSTAIN THE INTELLIGENCE INDUSTRIAL BASE

Without profits generated by the commercial space markets, IIB contractors can only rely on retained earnings or compete for dwindling federal research funds. Neither option is good for the IIB contractor nor the federal government because commercial market loss will degrade the ability of the remaining participants in the IIB from providing the research needed for new technology.[49] The one interested party with the ability to address the interests of all parties and provide direction in this dilemma is the

Congress. Its challenge is to direct an approach that will satisfy the requirements of competing interests without becoming a micromanager in an already confused situation.

The COMSAT Model

Some in Congress recognize and are working on the problem. Rep. Joel Hefley (R-CO) has introduced legislation to arrest the erosion of the U.S. share of the world commercial space market. His approach to the problem is to use the COMSAT model Congress provided in the early 1960's to gain leadership in the world satellite telecommunications market. His bill would direct the President to determine and forecast the U.S. requirements for space launch, and establish a public/private corporation: Launch Services Corporation.[50]

This corporation would raise private capital through the financial markets to provide launch services for the U.S. government and the commercial market, both foreign and domestic. The bill also ensures a guaranteed market for the corporation by guaranteeing that a number of government launches would be provided by this COMSAT-like corporation. The government would also provide start-up funding for non-recurring costs, access to U.S. launch centers, and technology from NASA and DOD. Unlike COMSAT, in which the government is still involved after over 30 years, the bill to establish Launch Services Corporation contains a "sunset provision" that requires

Launch Services Corporation to be a self-sufficient, private, for-profit business after 6 years.[51]

Rep. Hefley's strategy has a great deal of merit and is designed to reduce launch costs by 25 percent to 50 percent within the period of the government's involvement. However, given the current conflict over other public/private corporations, such as the Corporation for Public Broadcasting and Amtrak, this approach may not sell politically. The current political and fiscal environment appears hostile to methods the government used in the 1960's to solve federal problems. Given the trend from both ends of the political spectrum to downsize government, Launch Services Corporation may be viewed by critics on the left as a subsidy for defense contractors and on the right as an industrial policy that picks winners and losers in U.S. business.

The SEMATECH Model

Another approach the Congress could take is to borrow a methodology recently used in the Defense Technical Industrial Base (DTIB) to solve a similar problem and direct its use in the IIB. In 1979 the U.S. semiconductor industry represented the state of the art in microelectronics and set the standard for the world.[52] Japan's microelectronics industry, subsidized by the Japanese government, had cut into the U.S. share in the world market and with it cut U.S. profits needed for new technology development. Early in the Reagan Administration, DTIB policy makers recognized a serious shortfall in the ability of the U.S. semiconductor industry to provide state-of-the-art semiconductor chips needed for the coming generation of smart weapons. U.S. market share had eroded to the point where Japan surpassed U.S. market leadership in 1986. The DOD viewed this reversal as a threat to the DTIB's ability to produce high-tech weapons due to dependence on foreign sources. Congress authorized and directed DOD to create a federal and private consortium to counter this defense vulnerability and to regain the world semiconductor market for commercial sales. The result was SEMATECH.[53]

The Role of Congress in SEMATECH

SEMATECH was an alliance of DOD and private industry to pool funding and technology to regain U.S. preeminence in the world market. In 1987, Congress authorized $100 million per year for 5 years to be matched by 14 private firms which joined the alliance.[54] The federal government was essentially a short-term investment partner with industry. In the long term the government would be repaid its funding from tax revenues generated on the profits of the consortium members and through increased economic growth. The original management and employees of SEMATECH came entirely from the member firms. They were paid by the member firms and were assigned on loan to SEMATECH for three years. Additionally, national labs and educational institutions were invited to participate by providing research personnel.[55] DOD officials acted as a board of directors to ensure federal oversight and to provide reporting to Congress. Congress and DOD would provide "what to do" direction (regain world leadership in the semiconductor industry) and let the private firms of SEMATECH decide how to do it.

The private firms and research entities had incentives to cooperate on research for a number of reasons. First, in chartering SEMATECH, Congress granted anti-trust exemptions and other legal waivers to allow cooperative research without the bureaucratic delays required in applying to the Federal Trade Commission or Department of Justice for antitrust waivers. This meant that they could proceed in collaborating on R+D without having to ask permission at each successive step for fear of government agencies halting progress by bringing them to court.

Second, unlike other public/private corporations that produce an end product or service, SEMATECH concentrated on emerging technology and new production methods. The final products for the world market were left to the private sector members.[56] (This is the major difference with the Launch Services Corporation Approach which is designed to be a provider of launch service). Additionally, with DOD as a partner, the consortium members had a government partner with proprietary interest in deconflicting and negotiating policy with other government agencies.

<u>SEMATECH Results</u>

At first, non-members who could not afford the minimum funding requirement to join the consortium thought that SEMATECH represented a de facto industrial policy through which the government would pick the survivors in this competitive industry. However, as new semiconductors and manufacturing techniques were developed, the smaller companies reaped benefits as member companies subcontracted with them to produce increased amounts of chips and circuits as orders and U.S. market share grew.[57]

By April of 1988, SEMATECH was fully operational and providing advanced manufacturing processes that matched Japan's production capabilities. The real returns occurred in 1992 when, for the first time, SEMATECH surpassed the Japan's technology lead by developing the worlds smallest semiconductors and the U.S. surpassed Japan's lead in world sales of semiconductors. In the first five years after Congress directed SEMATECH's establishment, the U.S. reemerged as the world leader in semiconductor technology in both qualitative and quantitative terms.[58] In 1994, the U.S. standard for chip quality was recognized as exceeding the quality of Japan's and the U.S. was the world leader for chip production and sales. By the end of 1994, SEMATECH had generated the research and manufacturing base needed to assure U.S. dominance in the world semiconductor industry for the foreseeable future. Currently, DOD is in the process of bowing out of the consortium and the U.S. semiconductor industry is fully recovered.[59]

RECOMMENDATION

SEMATECH has been a success story of government and industry working together to solve a national problem. It provides a model to solve the space access problem that the IIB is currently experiencing. Congress could direct that the total of all DOD and NASA appropriations for space-lift R+D, currently about $1.3 billion, be consolidated and used as the government portion of the matching funding needed to start a space version of SEMATECH.[60] The NASA, DOD and other R+D funding for space launch would be matched by IIB contractors to develop competitive launch systems for the world market. No additional funding need be requested which would make the venture acceptable politically in the current budget environment. The combination of the technical expertise of the IIB and industry, joint public and private funding, and Congressional political direction to establish this entity could provide a result similar result to that the U.S. experienced in semiconductors in a similar period of time. Unlike a public corporation authorized to raise capital through third party investors, the corporate participants have the incentive to make this space lift consortium work since their capital and credit are at risk. Additionally, a "sunset" mechanism would provide the assurance that the government would not remain in the space launch business once world market leadership is regained.

CONCLUSION

In this age of global markets and global competition, the U.S. must regain world leadership in the commercial space market if it is to sustain its technologic advantage in the IIB. The U.S. cannot rely on one of the policy makers in the IIB (DOD, NASA, CIA, NRO) emerging over time as the lead player to coordinate and deconflict policy. Many of these policies are rooted in law and are beyond the legal authority of any one agency involved--even if parochial differences between them could be settled. The U.S. cannot afford a prolonged debate and continued degradation of the IIB. It has been almost ten years since the Challenger disaster and the IIB still does not have the type of space access it requires to maintain the U.S. technology edge vital to our national security. A cost effective and competitive lift capability must be developed or the IIB will degrade further. Without Congressional direction, the IIB will continue to be at risk.

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